



2012 Astrophysics Explorer Mission of Opportunity Pre-Proposal Workshop Technical, Management, and Cost Evaluation

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Introduction

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Outline

Purpose of the Presentation

Technical, Management, and Cost (TMC)
Evaluation

References

Questions



Introduction

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Purpose of this Presentation

1. Present to the proposing community the criteria and requirements that are assessed by the Technical, Management, and Cost (TMC) Panel. These criteria primarily are listed in the Stand Alone Missions of Opportunity Notice (SALMON-2) AO, section 7.2.4 - “TMC Feasibility of the Investigation Implementation, including Cost Risk.”
3. The 2012 Astrophysics Explorer Mission of Opportunity (MO) is a Program Element Appendix (PEA) L to the SALMON-2 AO. All proposers must read the SALMON-2 AO and the Astrophysics MO PEA L carefully, and all proposals must comply with the requirements, constraints, and guidelines contained within these documents.
4. Answer questions.



Introduction

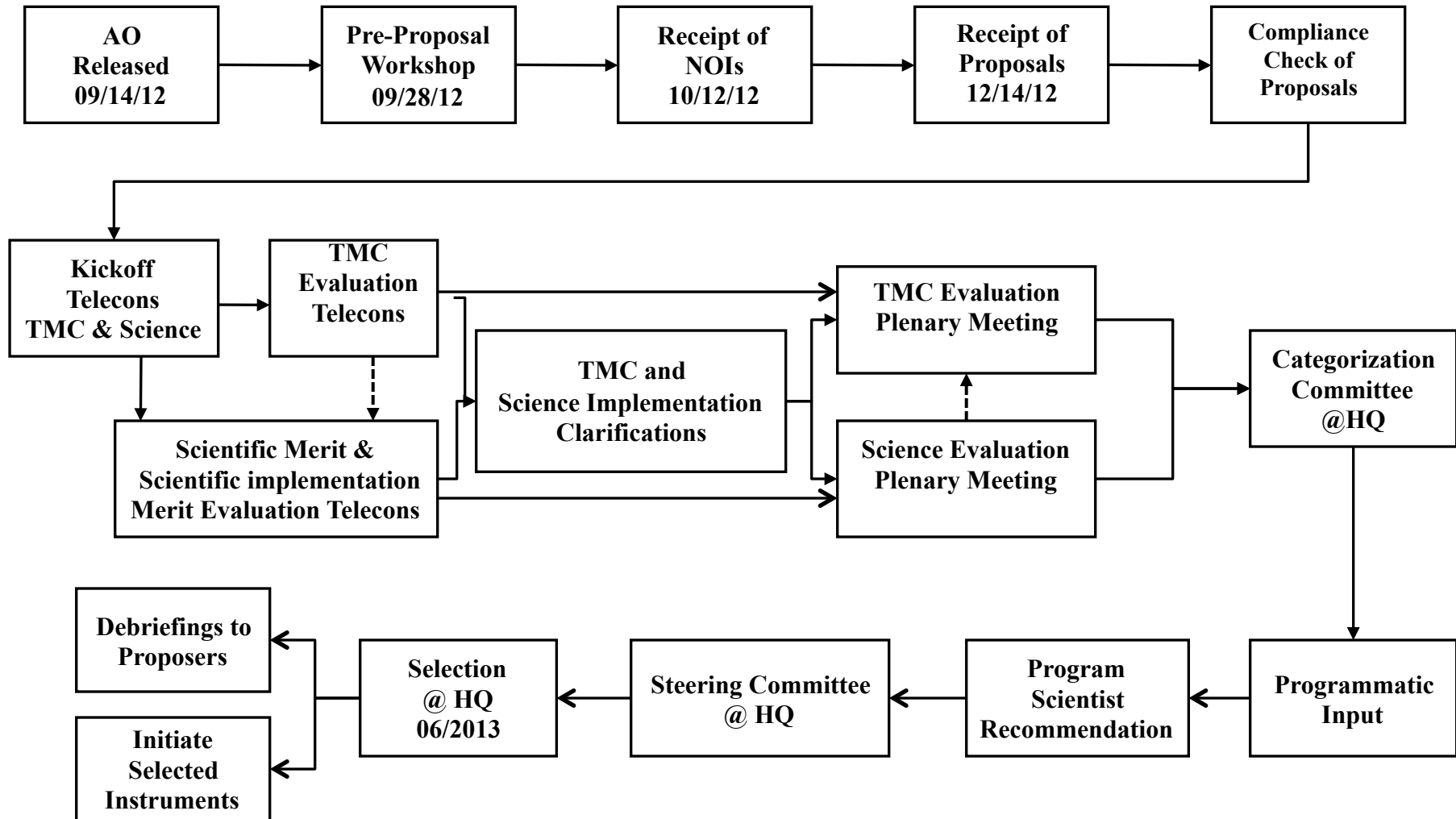
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Note: This is a single step selection process; no Phase A (Step 2) concept study report or downselection is planned.



Evaluation Flow Chart

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TMC Evaluation

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The **NASA Science Mission Directorate (SMD) Science Office for Mission Assessments (SOMA)** was established in 1996 by the Office of Space Science to support the Discovery and Explorer Programs, now also supports the New Frontiers, Mars Scout, Earth System Science Pathfinder (ESSP), and others such as SALMON-2. The TMC process is a standard process used by SOMA to support all SMD evaluations. Lessons learned from each evaluation are incorporated into the process for continuous improvement.

TMC Evaluation - The technical and management approaches of all submitted investigations will be evaluated to assess the likelihood that they can be successfully implemented as proposed, including an assessment of the likelihood of their completion within the proposed cost and schedule.

There are three possible Risk Ratings: LOW, MEDIUM, and HIGH

LOW Risk: There are no problems evident in the proposal that cannot be normally solved within the time and cost proposed. Problems are not of sufficient magnitude to doubt the Proposer's capability to accomplish the investigation well within the available resources.

MEDIUM Risk: Problems have been identified, but are considered within the proposal team's capabilities to correct within available resources with good management and application of effective engineering resources. Mission design may be complex and resources tight.

HIGH Risk: One or more problems are of sufficient magnitude and complexity as to be deemed unsolvable within the available resources.



TMC Evaluation

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TMC Envelope Concept

Envelope: Contains all TMC Resources available to handle known and unknown development problems that occur. Includes schedule and funding reserves; reserves and margins on physical resources such as mass, power, and data; descope options; fallback plans; and personnel.

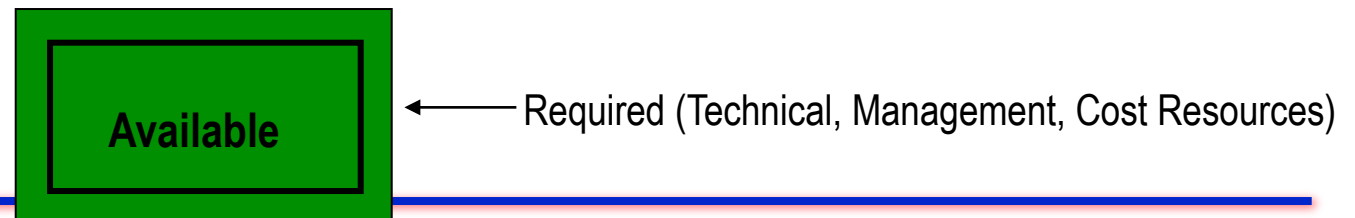
LOW Risk: Required resources fit well within available resources.



MEDIUM Risk: Required resources just barely inside available resources.
Tight, but likely doable



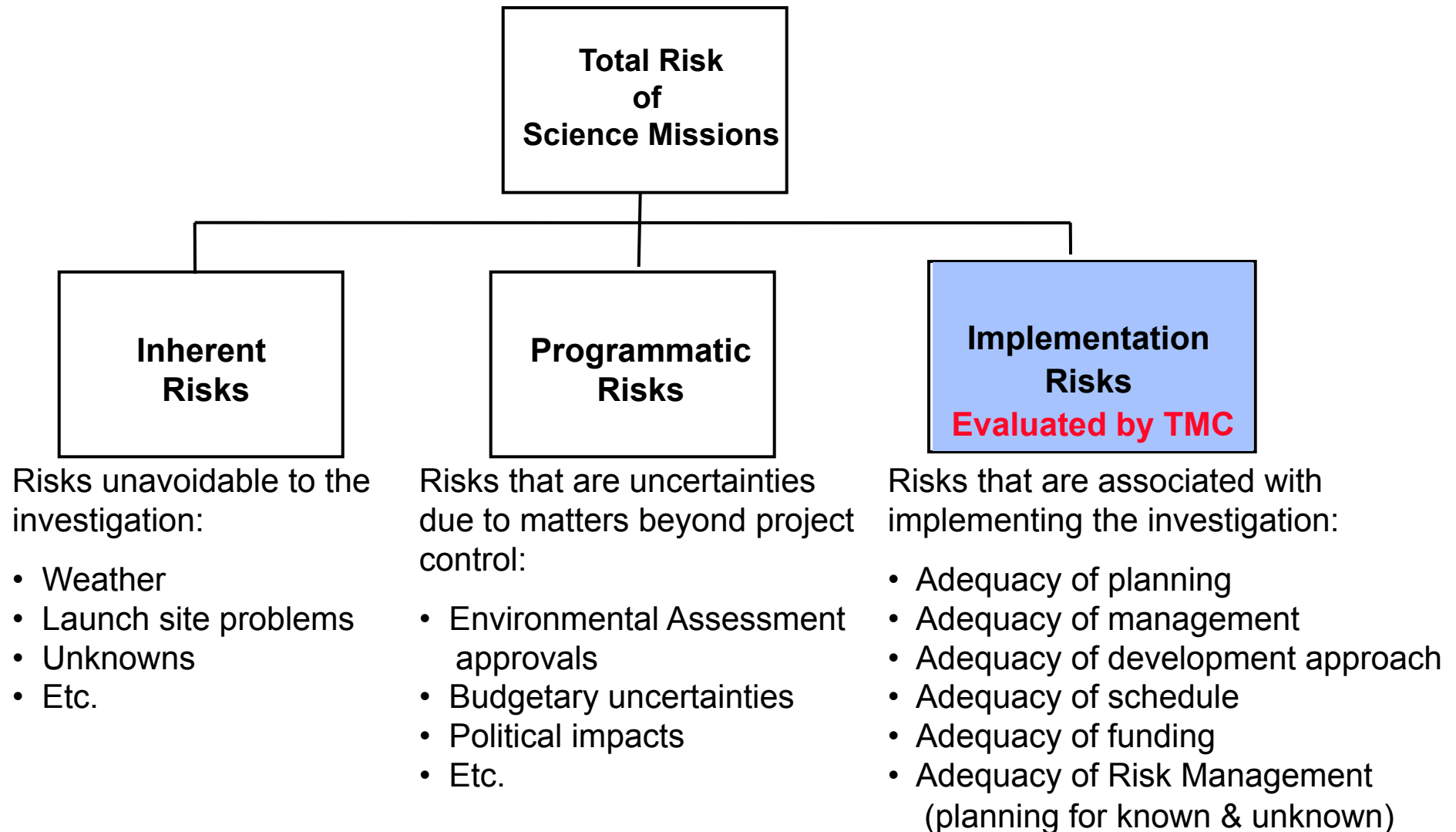
HIGH Risk: Required resources DO NOT fit inside available resources.
Expect project to fail





TMC Evaluation

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TMC Evaluation

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TMC Evaluation Principles

- **Basic Assumption: Proposer is the expert on his/her proposal.**
 - Proposer's task is to provide evidence that the investigation implementation risk is low.
 - TMC panel's task is to try to validate proposer's assertion of low risk.
- **All Proposals are evaluated to identical standards and not compared to other proposals.**
- **TMC Panels consist of evaluators who are experts in the areas of the proposals that they evaluate.**
- **TMC Panels develop findings for each proposal.**
 - Findings: "As expected" (no finding), "above expectations" (strengths), "below expectations" (weaknesses).
- **The Cost Analysis is integrated into overall risk.**
- **Proposal Risk Assessment:**
 - Proposals are based on Pre-Phase-A concepts; TMC Risk Assessments give appropriate benefit of the doubt to the Proposer.



TMC Panel Composition and Organization

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- The TMC panel is chaired by the Acquisition Manager, who is a civil servant in the Science Office for Mission Assessments (SOMA) at NASA Langley Research Center (LARC).
 - SOMA works directly for NASA Headquarters, and is firewalled from the rest of LaRC
- TMC evaluators are a mix of the best non-conflicted contractors, consultants, and civil servants who are experts in their respective areas of technology, management, or cost.
- If technical expertise that is not represented in the panel is required, specialist reviewers may be called upon to assist with one or more proposals.
 - Specialist reviewers evaluate only those parts of a proposal that are pertinent to their particular areas of technical expertise.



TMC Evaluation Factors

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The following are highlights of the criteria listed in the Stand Alone Missions of Opportunity Notice (SALMON-2) AO, section 7.2.4 – “TMC Feasibility of the Investigation Implementation, including Cost Risk.”

The technical and management approaches of all submitted investigations will be evaluated to assess the likelihood that they can be successfully implemented as proposed, including an assessment of the likelihood of their completion within the proposed cost and schedule. The factors for feasibility of investigation implementation include the following, **as applicable** for the investigation being proposed.

Factor C-1. Adequacy and robustness of the instrument implementation plan.

Factor C-2. Adequacy and robustness of the mission design and plan for mission operations.

Factor C-3. Adequacy and robustness of the flight systems.

Factor C-4. Adequacy and robustness of the management approach and schedule, including the capability of the management team.

Factor C-5. Adequacy and robustness of the cost plan, including cost feasibility and cost risk.



TMC Evaluation Factors

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- Where appropriate, the likelihood of meeting key delivery dates will be assessed.
- Mission resiliency (the flexibility to recover from problems) will be evaluated. This will include an assessment of the approach to de-scope the Baseline Investigation in the event that development problems force reductions in scope.
- Investigations that propose technologies having a Technology Readiness Level (TRL) less than 6 will be penalized for risk unless adequate justification is provided (see SALMON-2 Requirement B-27 for details.)
- The methods and rationale used to develop the estimated cost, and the discussion of cost risk, will be assessed. Proposals will be evaluated for adequacy of cost reserves; proposals with inadequate reserves and/or those that do not demonstrate a thorough understanding of cost risks will be rated accordingly.



TMC Evaluation Factors

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- The proposed risk management approach will be assessed, as well as any risk mitigations for new technologies, long-lead items, and the adequacy and availability of any required manufacturing, test, or other facilities.
- The role, qualifications, and experience of the Project Manager (PM) will be assessed, as well as the commitment and past performance of the PM and his/her implementing institution against the needs of the mission.
- Plans for managing the risk of contributed critical goods and services will be assessed, including the commitment of every partner as documented in letters of commitment, as well as the adequacy of contingency plans for coping with the failure of a proposed cooperative arrangement.



Examples of TMC Evaluation Factors and Sub-Factors

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- **Instrument**
 - Instrument Design, Accommodation, and Interface
 - Design Heritage
 - Environment Concerns
 - Technology Readiness
 - Instrument Systems Engineering
- **Mission Design and Operations**
 - Mass Margins
 - Trajectory Analysis
 - Launch Services
 - Concept of Mission Operations
 - Ground Facilities – New/Existing
 - Telecom
- **Flight Systems**
 - Hardware/Software Design
 - Design Heritage
 - Spacecraft Systems Design
 - Design Margins (Excluding mass)
 - Qualification and Verification
 - Assembly, Test, and Launch Operations
 - Mission Assurance
 - Development of New Technology
- **Management and Schedule**
 - Roles and Responsibilities
 - Team Experience and Key Individuals' Qualifications
 - Project Management and Systems Engineering
 - Organizational Structure and Work Breakdown Schedule (WBS)
 - International Participation
 - Risk Management, Including Descope Plan and Decision Milestones
 - Project-Level Schedule
 - Proposed Subcontracting Plans and SDB Participation.
- **Cost**
 - Basis of Estimate (BOE)
 - Cost Realism and Completeness
 - Cost Reserves by Phase
 - Comparison with TMC Estimates (Including Parametric Models/Analogies)



Clarifications

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SALMON-2 AO – Section 7.1 Overview of the Proposal Evaluation and Selection Process

The evaluation and selection process described in Section 7.1.1 of the SALMON-2 AO will be followed. “Proposers should be aware that, during the evaluation and selection process, NASA may request clarification of specific points in a proposal; if so, such a request from NASA and the proposer’s response must be in writing. In particular, before finalizing the evaluation of the feasibility of the investigation implementation (Section 7.2.4), NASA will request clarification on specific, potential major weaknesses in the feasibility of mission implementation that have been identified in the proposal. NASA will request clarification in a uniform manner from all proposers. The ability of proposers to provide clarification to NASA is extremely limited, as NASA does not intend to enter into discussions with proposers. A typical limited response is to direct NASA’s attention to pertinent parts of the proposal without providing further elaboration.”

Clarifications, if necessary, will be carried out after the TMC and Science Evaluations and be completed by the TMC and Science Plenary Meetings. (See slide #5 – Proposal Evaluation Process.)



Cost Requirements and Constraints

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4.4.1 Cost Requirements and Constraints (SALMON-2 PEA L)

The PI-Managed Mission Cost is defined in Section 4.3.1 of the SALMON-2 AO. Except for high-altitude scientific balloon missions, the PI-managed Mission Cost cap for an Astrophysics Explorer Mission of Opportunity, including all mission phases and the cost of accommodation on and/or delivery to the host mission, if applicable, is \$60M in Fiscal Year (FY) 2013 dollars. The PI-managed Mission Cost cap is \$30M in FY2013 dollars for high-altitude scientific balloon missions.



Cost and Basis of Estimate

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Basis of Estimate (BOE)—A record of the procedures, ground rules and assumptions, data, environment, and events that underlie a cost estimate's development and update. Good documentation of the BOE supports the cost estimate's credibility.

SALMON-2 AO – Section 7.2.4 Feasibility of the Investigation Implementation, including Cost Risk

Factor C-5. Adequacy and robustness of the cost plan, including cost feasibility and cost risk. This factor includes proposal elements such as cost, cost risk, cost realism, and cost completeness including assessment of the basis of estimate, the adequacy of the approach, the methods and rationale used to develop the estimated cost, the discussion of cost risks, the allocation of cost reserves by phase, and the team's understanding of the scope of work (covering all elements of the investigation, including contributions). Proposals will be evaluated for the adequacy of the cost reserves and whether proposals with inadequate cost reserves demonstrate a thorough understanding of the cost risks. This factor also includes an assessment of the proposed cost relative to estimates generated using parametric models and analogies. Also evaluated under this factor are the proposed cost tools to be used on the project.

Appendix B, Section H. COST AND COST ESTIMATING METHODOLOGY

The following expands requirements in the AO, in particular Requirement 52 through Requirement 63 and Requirement 74.

Requirement B-51. This section shall include a description of the methodologies used to develop the estimate. The cost estimating methodology discussion in this section shall provide an overview of the cost estimate development process. Any additional cost estimates or other validation efforts shall be described, the results presented, and any significant discrepancies discussed. The rationale for the proposed cost reserve levels shall be presented. Proposers shall provide additional Basis of Estimate data to assist the validation of their cost estimates. Examples of useful Basis of Estimate data include cost comparisons to analogous items/missions, vendor quotes, and parametric model results. (Note: inputs to parametric models are helpful in assessing the BOE.)



SALMON2-AO Section 5.10.3 Classified Proposal Appendix regarding Heritage

“In order to increase the capabilities of investigations proposed in response to this AO while minimizing the development and operations risks within the PI-Managed Mission Cost Cap, proposers may choose to leverage technology that was developed by other institutions and agencies as well as technology developed by NASA and NASA-funded partners. It is recognized that some technology relevant to proposed missions may have classified heritage.

Proposals that propose the use of hardware with classified heritage may provide a classified proposal appendix to NASA to allow validation of classified heritage claims. The classified appendix regarding heritage may include Letters of Validation for classified heritage claims from technology development sponsors. The proposer is responsible for determining what information is classified and what information is unclassified; any classified information provided to NASA must be handled appropriately.”

Note: Please let NASA know ASAP if you plan to submit a Classified Appendix regarding Heritage.



References

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2012 Astrophysics Explorer MO Acquisition Home Page

The 2012 Astrophysics Explorer AO Acquisition Home Page available at <http://soma.larc.nasa.gov/astrophysics.html>, will provide updates and any addenda during the solicitation process. It will provide links to the 2012 Astrophysics Explorer Program Library, a list of potential teaming partners, and questions and answers regarding the PEA L.

2012 Astrophysics Explorer MO Program Library

The Library provides additional regulations, policies, and background information. The Library is accessible at <http://soma.larc.nasa.gov/astrophysics/programlibrary.html>

Lessons Learned from Technical, Management, and Cost Review of Proposals 2nd Edition

<http://soma.larc.nasa.gov/index.html>



Questions?



Supplemental Information



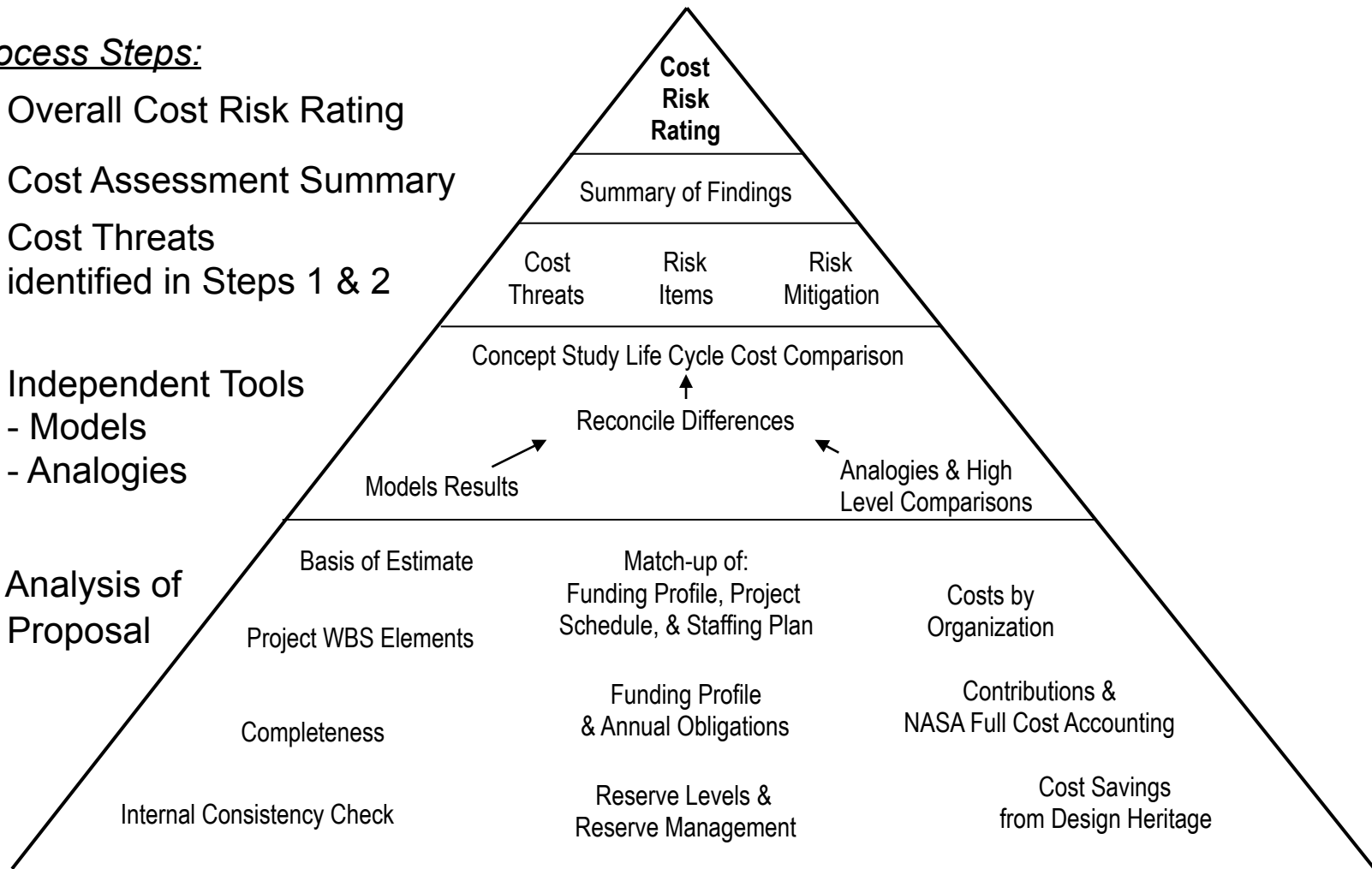
TMC Independent Cost Assessment

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“The Pyramid”

Process Steps:

5. Overall Cost Risk Rating
4. Cost Assessment Summary
3. Cost Threats
identified in Steps 1 & 2
2. Independent Tools
- Models
- Analogies
1. Analysis of
Proposal





Typical TMC Evaluation Questions

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- Will overall investigation approach allow successful implementation as proposed?
- If not, are there sufficient resources (time & funds) to correct identified problems?
- Does proposed design/development allow the investigation to have a reasonable probability of accomplishing its objectives and include all needed tools?
- Are requirements within existing capabilities or are advances required?
- Does the proposal accommodate sufficient resiliency in appropriate resources (e.g., funds, mass, power) to accommodate development uncertainties?
- Is there a Risk Management approach adequate to identify problems with sufficient warning to allow for mitigation without impacting the investigation's objectives?
- Does the proposer understand the known risks, including risk of using new developments, and are there adequate fallback plans to mitigate them, to assure that investigation can be completed as proposed?



Typical TMC Evaluation Questions

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- Is the schedule workable?
- Does it reflect an understanding of work to be done and the time it takes to do it?
- Is there a reasonable probability of delivering the investigation on time to meet the proposed dates?
- Does it include schedule margin?
- Will proposed management approach (e.g., institutions and personnel, as known, organization, roles and responsibilities, experience, commitment, performance measurement tools, decision process, etc.) allow successful completion of investigation? Is the PI in charge?
- Does the investigation, as proposed, have a reasonable chance of being accomplished within proposed cost?
- Are proposed costs within appropriate caps and profiles and does cost estimate cover all costs including full-cost accounting for NASA Centers?
- Are costs phased reasonably?
- Is there evidence in the proposal to give confidence in the proposed cost?
- Does the proposer recognize all potential risks/threats for additional costs or cost growth (e.g., late deliveries of components)?



Characteristics of LOW Risk Ratings

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- All risks for the project have been/are being identified and managed by the team, with plans to reduce or retire the risk before launch.
- No risk exists for which neither a workaround is planned, nor a very sound plan to develop and qualify the risk item for flight.
- The proposed project team and each of its critical participants are competent, qualified, and committed to execute the project.
- The project will be self managed to a successful conclusion while providing reasonable visibility to NASA for oversight.
- The team has thoroughly analyzed all project requirements, and consequently the proposed resources are adequate to cover the projected needs, including an additional percentage for growth during the design and development, and then a margin on top of that for unforeseen difficulties.
- The schedule includes reserve time, to find and fix problems if things do not go according to plan.
- All contributed assets for the project are backed by letters of commitment.
- The team understands the seriousness of failing to meet technical, schedule, or cost commitments for the project in today's environment.



Characteristics of HIGH Risk Ratings

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Technical Design Margins (Mass, Power, etc.)

- Insufficient data provided from which to independently verify the margins.
- No margin provided or conflicting data provided.
- Margin provided deemed too low based on the maturity of the design.

Cost

- Concerns relating to cost reserve (Below AO requirement, too low based on liens/threats, phasing inconsistent with anticipated needs).
- Unable to validate proposed cost
- Insufficient Basis of Estimate

Instrument Implementation

- Heritage claims not substantiated/development risks not adequately addressed.
- Inadequate/inconsistent description and detail.
- Inconsistencies between instrument requirements and bus capabilities.



Characteristics of HIGH Risk Ratings

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Complex Operations

- More common in payloads containing multiple instruments that required tight scheduling/sequential operations. Operations not adequately addressed.

Systems Engineering

- Incomplete flow-down of science requirements to payload/flight system accommodations.
- Incomplete description of how the systems engineering function will be executed.
- Inadequate resources allocated to accomplish this function.

Management Plans

- Confusing/conflicting organizational roles and responsibilities.
- Lack of demonstrated organizational/individual expertise for specified role.
- Insufficient time commitments for key personnel.

Schedules

- Insufficient detail from which to perform an independent assessment.
- Inadequate/no schedule reserve identified.
- Overly ambitious schedules that are not consistent with recent experiences.